

STATE OF CALIFORNIA
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

SUPPLEMENTAL SHEET FOR REGULAR MEETING OF JULY 7, 2006
Prepared on June 26, 2006

ITEM NUMBER: 10

SUBJECT: Agricultural Discharge Regulation Update: Monitoring Data
from the Cooperative Monitoring Program

DISCUSSION

Waiver Order R3-2004-0117 identified cooperative monitoring as an option for meeting the mandated monitoring requirement of all conditional waivers of waste discharge requirements for irrigated lands (Ag Waivers). In response, the agricultural industry formed Central Coast Water Quality Preservation, Inc. (Preservation Inc.), for the purpose of conducting agricultural water quality monitoring. Preservation Inc. began monitoring in January 2005, as required by the Order, and has continued monthly monitoring since then. The following is a summary of the Cooperative Monitoring Program data from January 2005 through December 2005 (Phase I).

The five objectives of Cooperative Monitoring Program are:

1. assess the status of water quality and associated beneficial uses in agricultural areas;
2. identify problems associated with agricultural activities;
3. conduct focused monitoring to further characterize problem areas and better understand sources of impairment (follow up);
4. provide feedback to growers in problem areas; and
5. track changes in water quality and beneficial use support over time and evaluate the Ag Waiver program's effectiveness.

Preservation Inc. sampled 25 sites during the first year of the program (Phase I).

Fifteen sites are located in the lower Salinas watershed, and ten are located in the lower Santa Maria watershed. Water Board staff and Preservation Inc. chose the Phase I sites based on previous water quality data that demonstrated significant impairments in those watersheds, predominance of irrigated agriculture and availability of start up funding. (Twenty-five additional sites in agricultural areas throughout the region were added in January 2006, and all 50 sites are now being monitored as Phase II.)

Conventional water quality sampling (flow, DO, pH, temperature, turbidity, nitrate as N, organophosphate as P, total ammonia, and chlorophyll a) was conducted monthly.

In addition, toxicity testing was conducted on three different organisms. Water column toxicity for *Ceriodaphnia* (a crustacean), *Pimephales* (a fish), and *Selenastrum* (an alga) occurs twice during the wet season and twice during the dry season, for a total of four times a year for all three organisms. Sediment toxicity for *Hyallela* (a benthic invertebrate) and in-stream benthic invertebrate assessments occur once a year.

Ceriodaphnia dubia is a water flea, known to be especially sensitive to organophosphate pesticides such as chlorpyrifos and diazinon. Pyrethroid pesticides tend to be particularly toxic to fish, such as *Pimephales*. *Selenastrum*, an alga, is used to test for toxicity to aquatic plants. *Selenastrum* can also be

used to test for "biostimulation" from nutrients, although it should be noted that the presence of both herbicides and nutrients potentially have a confounding effect on growth.

Water board staff is focusing on four tasks:

1. Maintain a web-based data delivery system, with the ultimate goal of transferring information into a publicly available website and the State's California Integrated Water Quality System (CIWQS).
2. Perform quality assurance and quality control (QA/QC) evaluations for data integrity for the first year of data.
3. Review data findings.
4. Conduct follow up monitoring to better understand causes of toxicity.

Regional Board staff is still performing QA/QC analysis on the first year of data. Any data with QA/QC errors (e.g. missing detection limit values, incorrect abbreviations, empty cells) is flagged, corrected, or eliminated from the data analysis process, as appropriate. At this time, staff is still identifying errors, and therefore the following summaries do not include the entire suite of data. The information provided below represents all submitted data without errors.

Objective 1 – Assess status of water quality

Our review of the data confirms the following water quality conditions, including high nutrient levels and toxicity at many sites.

Nitrate as N

The drinking water standard for nitrate is 10mg/L $\text{NO}_3\text{-N}$. Twelve of 25 sites had a yearly mean nitrate value above the drinking water standard. Two sites had samples that were up to six times the drinking water standard. Sites with high nitrate values tended to be highly variable in nitrate concentrations throughout the year.

Orthophosphate as P

Phosphate values were highly variable between sites and among samples from the same site taken at different times, and ranged from 0.007 to 2.400 mg/L P. Eight sites had means above 0.5 mg/L. Phosphate standards have not been established in our Basin Plan. EPA and other research have recommended setting standards between 0.038-0.4 mg/L to prevent excessive benthic algal growth. Values above 0.5 mg/L P are well above the upper limit recommended by EPA.

Un-ionized Ammonia as N

The un-ionized ammonia standard is 0.025 mg/L N. Values were consistent within and between sites, and ranged from 0.001-0.094 mg/L N. Only one site had values above the standard.

Oxygen saturation

The Basin Plan states that median oxygen values should not fall below 85 percent saturation. Five sites had means where saturation was lower than 85%. Values for all sites ranged from 28.5-139%.

pH

The Basin Plan pH standard for Municipal and Domestic supply, Agricultural supply and Recreations 1 and 2 states pH values should be no higher than 8.3. Three sites had means above 8.3. Values were relatively constant within and between sites and ranged from 7.1-9.0

Turbidity

Water quality criteria have not been established for turbidity. The Central Coast Ambient Monitoring Program (CCAMP) dry season action level is set at 10 NTUs. (This value is very low relative to turbidity from winter storm events, but is high relative to turbidity during the rest of the year when suspended sediments are typically not elevated.) Values were highly variable within and between sites, and ranged from 17-3,000 NTU.

Toxicity

Fish: Statistically significant water column toxicity to fish occurred at 12 sites. Of those 12 sites, three sites showed toxicity greater than 40% (toxicity is equivalent to mortality). No site showed 100% toxicity.

Algae: Significant toxicity to algae occurred at four sites, and with less than 25% mortality in all cases.

Invertebrates/Insects: Water column toxicity to *Ceriodaphnia* (water flea) was widespread and acute in both the Santa Maria and lower Salinas watersheds. Significant toxicity was found in over half of all samples, and 90% of those samples were 100% toxic.

Benthic Invertebrates: Sediment toxicity to *Hyallela* (a benthic invertebrate) was also high; 88% of sediment samples were shown to be toxic. Almost half the sediment samples that showed toxicity were 100% toxic.

Objectives 2 and 3 – Identifying problems associated with agricultural activities, and conducting focused monitoring

Based on the extent of toxicity, Regional Board staff and Preservation Inc. agreed to a more focused monitoring effort to better understand toxicity sources. It is well documented in scientific literature that *Ceriodaphnia* is sensitive to organophosphate pesticides. Several local researchers have proven that the organophosphate pesticides chlorpyrifos and diazinon are causes of this toxicity in our region. Problems with these two chemicals occur world-wide, and there are at least 17 scientific papers documenting toxicity in association with chlorpyrifos and diazinon in Africa, Europe and the United States.

Given this background information, staff suggested that follow up should focus on confirming whether these two chemicals are still a major source of toxicity, and identifying management practices to eliminate toxicity. Continued Phase II monitoring will determine if actions are

effective. Preservation Inc. submitted a solid proposal, which includes both a water quality monitoring component and an education and training component. Chemical monitoring will be conducted alongside toxicity monitoring at the 25 Phase I sites. This includes analyzing the 25 sites for a suite of 25-30 organophosphate pesticides (including chlorpyrifos and diazinon) for one year. Sampling will occur during the next four Phase II toxicity-sampling events, July 2006-July 2007.

Objective 4 – Provide feedback to growers

Preservation Inc. will work with watershed coordinators and the technical assistance agencies to set up education and training events focused on resolving the toxicity problem. Water Board staff and Preservation Inc. will continue to work together to oversee efforts by growers to implement practices that reduce toxicity.

Objective 5 – Detecting trends and evaluating program effectiveness

The Cooperative Monitoring Program is designed to detect long-term trends in water quality in agricultural areas, as well as identify toxicity associated with agricultural pesticides. All sources of data will be incorporated into our evaluation of watershed water quality. When sources of toxicity other than agriculture are identified, we will pursue those sources as well.

Follow up is a continuous process that allows for a systematic approach to solving problems through monitoring, education and outreach, and management practice adjustment. We recognize that several years of data will be needed before we can draw conclusions about water quality trends for constituents such as nutrients. In the interim, we will track changes in management practices as part of performance monitoring, to better understand the link between practice

implementation and water quality improvement.

CONCLUSION

The data show that water quality parameters sometimes significantly exceed standards for nutrients and toxicity. Although water column toxicity is widespread and acute, staff is optimistic that it can be resolved. As mentioned, previous local studies showed that chlopyrifos and diazinon were primarily responsible for toxicity in these two areas. It is reasonable to assume that these two chemicals are still causing at least some of the present toxicity. The nature of both chemicals is that they break down quickly; widespread effort to prevent these chemicals from entering waterways has the potential to show significant reduced toxicity before the expiration of the current Ag Waiver in 2009.

Preservation Inc. is responding to the data in a proactive manner. They continue to show sustained effort and dedication toward organizing a large sampling effort, and toward resolving water quality problems by helping growers understand problems and change their farming practices.

Improved water quality is our long-term goal and we will implement changes as needed to achieve it. We will measure our success in improving water quality through continued monitoring, and report our findings to the Water Board on a regular basis. Based on the empirical results, the Water Board (and the public) will know whether we are successful.

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